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## ON THE MUTUAL RELATIONS OF THE HEMIBRANCHIATE FISHES.

BY THEODORE GILL.

§ 1. *Introductory.*

In my "Arrangement of the Families of Fishes," (1872, p. 13, 14) before I was aware of the peculiarities of the shoulder girdle, and only knowing the characters assigned to the order by Cope, I retained the Hemibranchii in the order Teleocephali, but in the introductory commentary (p. xxxix) I raised the group to ordinal rank, to which it seems entitled. Prof. Cope, however, is entitled to the credit of having first appreciated the distinctness of the group as a whole, although the characters assigned to it were not, perhaps, of the highest systematic value. As now understood, the order seems to be definable as follows:—

## HEMIBRANCHII.

- = *Hemibranchii*, Cope, Proc. Am. Ass. Adv. Science, v. 20, p. 338, 1872.
- = *Hemibranchii*, Gill, Arrangement Families Fishes, p. xxxix, 1872 (Based on shoulder girdle).
- = *Hemibranchii*, Cope, Proc. Am. Phil. Soc., v. 13, p. 25, 1873.
- = *Hemibranchii*, Gill, Johnson's New Universal Cyclopædia, v. 2, p. 872, 1877 (defined).
- = *Hemibranchii*, Jordan & Gilbert, Syn. Fishes N. Am., p. 387, 1882.
- Acanthopterygii*, fam., auct. plur.

In the "Arrangement of the Families of Fishes" (1872, pp. 13, 14), six families were recognized for the Hemibranchs, whose combinations and correspondence with the families of previous authors are shown in the following abstract:—

“(H. *Gasterosteiformes*.)

## (Gasterosteioidea.)

- |                           |   |
|---------------------------|---|
| 133. <i>Gasterosteidæ</i> | <i>Gasterosteidæ</i> , Gthr., i, 1-7.                       |
| 134. <i>Aulorhynchidæ</i> | <i>Aulorhynchoidæ</i> , Gill, P. A. N. S. Phil., 1862, 233. |

## (Aulostomoidea.)

- |                          |   |
|--------------------------|---|
| 135. <i>Aulostomidæ</i>  | <i>Fistulariidæ</i> , Gthr., iii, 529, 535-538. |
| 136. <i>Fistulariidæ</i> | <i>Fistulariidæ</i> , Gthr., iii, 529-534.      |

## (H. Centrisciformes.)

137. *Centriscidæ*                      *Centriscidæ*, Gthr., iii, 518-524.  
 138. *Amphisilidæ*                    *Centriscidæ*, Gthr., iii, 518, 524-527."

In the "Introduction to the Study of Fishes" (1880, p. 507), Dr. Günther has referred the Aulorhynchoid fishes to the family Fistulariidae.

In the "Synopsis of the Fishes of North America" (1882, p. 387), five families were recognized for American species by Messrs. Jordan & Gilbert, and grouped as follows:—

"\* Bones of head produced into a long tube, which bears the short jaws at its end.

a. Body short, compressed, scaly; no teeth; spinous dorsal present. . . . . *Centriscidæ*, 60.

aa. Body elongate; teeth present.

b. Dorsal spines none; a long caudal filament; no scales.

*Fistulariidae*, 61

bb. Dorsal spines present, disconnected; no caudal filament.

c. Body covered with ctenoid scales. *Aulostomatidæ*, 62.

cc. Body scaleless, with bony shields.

*Aulorhynchidæ*, 63.

\*\* Bones of head moderately produced; ventrals I, 1; dorsal preceded by free spines; body scaleless, naked or mailed.

*Gasterosteidæ*, 64."

On a recent review of the forms of the order, I am more than ever convinced of the aptness of the classification proposed by myself in 1872 and submit the following table and characters which will, I think, amply justify that confidence. Far from being able to see any close affinity between the Aulorhynchidæ and Aulostomidæ, I am unable to appreciate any very distinctive differences from the Gasterosteidæ, and the close affinity between *Aulorhynchus* and *Spinachia* is such that I regard the family Aulorhynchidæ simply as a convenient one at the most, and as expressing the culmination in one direction of the tendency characteristic of the order. I should be scarcely disinclined to dissent from any who should combine the Gasterosteidæ and Aulorhynchidæ in one family.

§ 2. *Synopsis of Families.*

- I. Dermal armature absent or developed only as plates on sides or back; vertebræ numerous (30 to 86); pubic bones connected with scapular arch; spinous dorsal represented by isolated spines.
  1. Vertebræ anteriorly little enlarged; ventrals subthoracic, with enlarged spines (*Gasterosteioidea*).
    - a. Branchiostegal rays three; ventrals with one ray each; snout conic or but slightly tubiform. *Gasterosteidæ*.
    - b. Branchiostegal rays four; ventrals with four rays each; snout tubiform. *Aulorhynchidæ*.
  2. Vertebræ anteriorly (first four) elongate; ventrals sub-abdominal or near middle, without spines, but with 6 (or 5) rays (*Aulostomoidea*).
    - c. Dorsal spines developed, weak; body compressed, moderately long, with ctenoid scales. *Aulostomidæ*.
    - d. Dorsal spines undeveloped; body depressed or sub-cylindrical, very long, without scales (caudal with the two middle rays produced into a long filament). *Fistulariidæ*.
- II. Dermal armature superficial, developed anteriorly and especially about the back; four anterior vertebræ much elongate; tail with its axis continuous with that of the abdomen; branchi-hyals and pharyngeals mostly present (fourth superior branchi-hyal and first and fourth superior pharyngeals only wanting); pubic bones not connected with the scapular arch; a spinous dorsal fin developed (*Macrorhamphosoidea*). *Macrorhamphosidæ*.
- III. Dermal armature connate with the internal skeleton, and developed as (1) a dorsal cuirass in connection with the neuropophyses and (2) lateral shields connected with the ribs; vertebræ reduced; six or more anterior vertebræ extremely elongate, with normal articulations of centra; tail with its axis deflected from that of the abdomen by encroachment of a dorsal cuirass over the dorsal fin; branchial system feebly developed (fourth superior branchi-hyal and all the superior pharyngeals wanting); pubic bones not connected with the scapular arch; a spinous dorsal feebly developed under the posterior projection of the dorsal buckler. (*Amphisiloides*). *Amphisilidæ*.

§ 3. *Diagnoses of Groups.***GASTEROSTEIDÆ.***Synonyms as families.*

- < *Atractosomes*, Duméril, Zool. Anal., 14e fam., p. 124, 1806.
- < *Acanti*, Rafinesque, Indice d'Ittiolog. Siciliana, 15. ord., p. 18, 1810.
- < *Atractomia* (*Caranzia*), Rafinesque, Analyse de la Nature, 8e fam., p. —, 1815.
- < *Scombéroides*, Cuvier, Règne Animal [1. ed.], t. 2, p. 311 (319), 1817.
- < *Percoides*? Latreille, Fam. Nat. du Règne Animal, p. 135, 1825.
- < *Centronotides*, Risso, Hist. Nat. de l'Europe Merid., t. 3, p. 426, 1826.
- < *Zeidæ*, Swainson, Nat. Hist. and Class. Fishes, etc. v. 2, p. 241, 1839.
- < *Triglidæ* (*Gasterosteini*), Bonaparte, Giorn. Accad. di Scienze, v. 52 (Saggio Distrib. Metod. Animali Vertebr. a Sangue Freddo, p. 32), 1832.
- = *Gasterosteidæ*, Bonaparte, Nuovi Annali delle Sci. Nat., t. 2, p. 133, 1838; t. 4, p. 275, 1840.
- = *Gasterosteidæ*, Girard, Expl. and Surv. for R. R. Route to Pacific Oc., v. 10, Fishes, p. 84, 1858.
- = *Gasterosteoides*, Bleeker, Enum. Sp. Pisc. Archip. Ind., p. xxiii, 1859.
- = *Gasterosteidæ*, Günther, Cat. Fishes Brit. Mus., v. 1, p. 1, 1859.
- = *Gasterosteoidæ*, Gill, Cat. Fishes E. Coast N. A., p. 39, 1861.
- = *Gasterosteidæ*, Cope, Proc. Am. Assoc. Adv. Sci., v. 20, p. 338, 1872.
- = *Gasterosteï*, Fitzinger, Sitzungsber. K. Akad. der Wissensch. (Wien), B. 67, 1. Abth., p. 34, 1873.
- = *Gasterosteidæ*, Günther, Int. to Study of Fishes, p. 504, 1880.
- = *Gasterosteidæ*, Jordan & Gilbert, Syn. Fishes N. Am., pp. 387, 392, 1833.
- Percoides* [?], Latreille, 1825.
- Triglidæ*, Subf. *Gasterosteini*, Bonaparte, 1832.

Hemibranchs with the anterior vertebræ little enlarged, a more or less fusiform body, conic or moderately produced snout, sides naked, or with a row of bony shields, and ventrals subthoracic, each with a large spine, and one or two rays.

**Apeltinæ.**

Gasterosteids with post-thoracic ventrals, pubic bones widely separated behind and extending on the sides, a moderately projecting snout, and a moderate caudal peduncle.

**APELTES.**

- = *Apeltes* (Brevoort), Gill, Cat. Fishes E. Coast N. A., p. 39, 1861; Canad. Nat., n. s., v. 2, p. 8.
- = *Apeltes*, Jordan, Man. Vertebrates Northern U. S., p. 249, 1876.
- < *Gasterosteus*, Sauvage, Nouv. Arch. Mus. d'Hist. Nat. Paris, t. 10, pp. 7, 29, 1874. (Subgenus).

Apeltines with the branchial apertures restricted and three free dorsal spines.

Type, *A. quadracus* = *Gasterosteus quadracus* Mitch.

### Gasterosteinae.

*Synonyms as subfamilies.*

- < *Gasterosteini*, Bonaparte, Giorn. Accad. di Scienze, v. 52 (Saggio Distrib. Metod. Animali Vertebr. a Sangue Freddo, p. 32), 1832; Nuovi Annali delle Sci. Nat., t. 2, p. 133, 1838; t. 4, p. 275, 1840.
- < *Gasterosteinae*, Gill, Cat. Fishes E. Coast N. A., p. 39, 1861; Canad. Nat., n. s., v. 2, p. 8, 1865.

Gasterosteids with post-thoracic ventrals, pubic bones connected and constituting a triangular median plate, a moderately projecting snout, and a moderate caudal peduncle.

### EUCALIA, Jordan.

= *Eucalia*, Jordan, Man. Vertebrates Northern U. S., p. 248, 1876.

*Gasterosteus* sp., Kirtland, Agassiz, *et al.*

Gasterosteines with the branchial apertures confluent, and four or five non-divergent and equally reclinable free dorsal spines.

Type, *E. inconstans* = *Gasterosteus inconstans* Kirtland.

### PYGOSTEUS.

- < *Leiurus*, Swainson, Nat. Hist. and Class. Fishes, etc., v. 2, pp. 175, 242 (subgenus).
- = *Pygosteus* (Brevoort), Gill, Cat. Fishes E. Coast N. A., p. 39, 1861; Canad. Nat., n. s., v. 2, p. 8.
- = *Pygosteus*, Jordan, Man. Vertebrates Northern U. S., p. 249, 1876.
- = *Gasterostea*, Sauvage, Nouv. Arch. Mus. d'Hist. Nat. Paris, t. 10, pp. 7, 29, 1874. (Subgenus).
- Gasterosteus* sp., Artedi, Linnæus, Lacépède, Cuvier, Fleming, Cuv. & Val., Girard, Günther, etc.
- Gasteracanthus* sp., Pallas.

Gasterosteines with the branchial apertures confluent (the branchiostegal membrane having a free inferior margin), and seven to eleven generally divergent spines.

Type, *P. pungitius* = *Gasterosteus pungitius* L.

### GASTEROSTEUS.

- < *Gasterosteus*, Artedi, Genera Piscium, p. 52, 1738.
- < *Gasterosteus*, Linnæus, Syst. Nat., ed. x, t. 1, p. 295, 1758.
- < *Gasterosteus*, Lacépède, Hist. des Poissons, t. 3, p. —, 1802.
- < *Gasteracanthus*, Pallas, Zoographia Rosso-Asiatica, t. 3, p. 228 (1811), 1831,

- < *Gasterosteus*, Cuvier, Règne Animal, 1re éd., t. 2, p. 300, 1817.  
(Subgenus).  
 < *Gasterosteus*, Fleming, Hist. Brit. Animals, p. 219, 1828.  
 < *Gasterosteus*, Cuvier & Valenciennes, Hist. Nat. des Poissons, t. 4, p. 479, 1829.  
 × *Gasterosteus*, Swainson, Nat. Hist. and Class. Fishes, etc., v. 2, pp. 175, 242, 1839.  
 × *Leiurus*, Swainson, Nat. Hist. and Class. Fishes, etc., v. 2, pp. 175, 242.  
(Subgenus).  
 < *Gasterosteus*, Girard, Expl. and Surv. for R. R. Route to Pacific Oc., v. 10, Fishes, p. 85, 1853.  
 < *Gasterosteus*, Günther, Cat. Fishes Brit. Mus., v. 1, p. 2, 1859.  
 = *Gasterosteus*, Gill, Cat. Fishes E. Coast N. A., p. 39, 1861; Canad. Nat., n. s., v. 2, p. 8, 1865.  
 < *Gasterosteus*, Sauvage, Nouv. Arch. Mus. d'Hist. Nat. Paris, t. 10, pp. 7, 9, 1874. (Subgenus.)  
 = *Gasterosteus*, Jordan, Man. Vertebrates Northern U. S., p. 248, 1876.

Gasterosteines with the branchial apertures restricted (the branchiostegal membrane being attached below), and two free divergent spines.

Type, *G. aculeatus* L.

#### **Spinachiinæ.**

##### *Synonymy.*

- Spinachianæ*, Gill, Proc. Acad. Nat. Sc. Phila., v. 14, p. 233, 1862.  
*Spinachiinæ*, Gill, Johnson's New Universal Cycl., v. 4, p. 558 (under "Stickle-back"), 1878.

Gasterosteids with a very projecting subtubiform snout, sub-abdominal ventrals, and elongated caudal peduncle.

#### **SPINACHIA.**

- = *Les Gastrés (Spinachia)*, Cuvier, Règne Animal, t. 2, p. 320, 1817.  
 = *Spinachia*, Fleming, Hist. Brit. Animals, p. 219, 1828.  
 = *Polycanthus*, Swainson, Nat. Hist. and Class. Fishes, etc., v. 2, pp. 175, 242.  
 = *Gastræa*, Sauvage, Nouv. Arch. Mus. d'Hist. Nat. Paris, t. 10, pp. 7, 29, 1874. (Subgenus).  
*Gasterosteus* sp., Linn., et al.

Spinachiines of unique type.

Type, *S. vulgaris* = *Gasterosteus spinachia* Linn.

#### **AULORHYNCHIDÆ.**

##### *Synonyms as family names.*

- = *Aulorhynchoidæ*, Gill, Proc. Acad. Nat. Sci. Phila. [v. 14], p. 233, 1862.  
 = *Aulorhynchidæ*, Gill, Arrangement Families Fishes, p. 14, 1872.

= *Aulorhynchidæ*, Jordan & Gilbert, Syn. Fishes, N. Am., pp. 387, 391, 1883.

*Fistulariæ*, gen., Günther.

*Synonym as subfamily name.*

= *Aulorhynchinæ*, Gill, Proc. Acad. Nat. Sci. Phila. [v. 13], p. 169, 1861.

Hemibranchs with the anterior vertebræ little enlarged, an elongated subcylindrical body, elongated tubiform snout; sides with a row of bony shields, and ventrals subthoracic, with a spine and four rays each.

#### AULORHYNCHUS.

= *Aulorhynchus*, Gill, Proc. Acad. Nat. Sci. Phila. [v. 13], p. 169, 1861.

= *Auliscops*, Peters, Monatsber. K. Preuss. Akad. Wiss., 1866, p. 510, 1866.

Aulorhynchids with a smooth-skinned crown and tube, lateral plates unarmed and hidden in the skin, dorsal spines (25-26) moderately short, and naked back.

Type, *A. flavidus* Gill.

#### AULICHTHYS.

= *Aulichthys* (Brevoort), Gill, Proc. Acad. Nat. Sci. Phila. [v. 14], p. 234, 1862.

*Aulorhynchus* sp., Steindachner.

Aulorhynchids with a corrugated crown and rostral tube, lateral plates each armed with a longitudinal posteriorly spinous ridge, dorsal spines (about 25) very short and transversely triangular, and reclining in grooves, behind each of which is a small plate.

Type, *A. Japonicus* (Brev.) Gill.

#### AULOSTOMIDÆ.

*Synonymy.*

< *Aulostomides*, Latreille, Fam. Nat. du Règne Animal, p. 129, 1825.

< *Aulostomatidæ*, Cantor, Cat. Malayan Fishes, p. 211, 1850.

= *Aulostomatoidei*, Bleeker, Enum. Sp. Piscium Archip. Ind., p. xxiii, 1859.

< *Aulostomatoids*, Gill, Proc. Acad. Nat. Sci. Phila. [v. 13], p. 168, 1861.

= *Aulostomidæ*, Gill, Arrangement Families Fishes, p. 14, 1872.

< *Aulostomateidæ*, Cantor, Day, Fishes of India, v. 1, p. 360, 1878.

= *Aulostomatidæ*, Jordan & Gilbert, Syn. Fishes N. Am., pp. 387, 390, 1883.

*Bouches en flute*, gen., Cuvier.

*Fistularidæ*, gen., Günther, et al.



Hemibranchs with the first four vertebræ elongated, the form elongated compressed, with an elongated tubiform mouth; the body covered with cycloid scales, with subabdominal ventrals composed of six rays but without spines, and with a series of dorsal spines.

#### AULOSTOMA.

= *Aulostoma*, Lacépède, Hist. Nat. des Poissons, t. 5, p. 357, 1803.

< *Polypterichthys*, Bleeker, Natuurk. Tijdschr. Nederlandsch Indie, v. 4, p. 608.

*Fistularia* sp., Linn.

*Solenostomus* sp., Gronow.

Aulostomids with a much compressed body, rudimentary teeth, 8–12 dorsal spines, opposite oblong dorsal and anal (with 23–28 rays each), and a cuneiform caudal.

Type, *A. chinensis* = *Fistularia chinensis* Linn.

#### FISTULARIIDÆ.

*Synonyms as family names.*

< *Siphonostomes*, Duméril, Zool. Anal., 23e fam., p. 138, 1806.

*Centrischini*? Rafinesque, Indice d'Ittiologia Siciliana, p. 34, 1810.

< *Siphostomia* (*Aulostomia*), Rafinesque, Analyse de la Nature, 20e fam., p. —, 1815.

< *Bouches en flute*, Cuvier, Règne Animal [1re éd.], t. 2, p. 348, 1817; 2e éd., t. 2, p. 267, 1829.

< *Aulostomides*, Latreille, Fam. Nat. du Règne Animal, p. 129, 1825.

< *Centrisceides*, Risso, Hist. Nat. de l'Europe Merid., t. 3, p. 476, 1826.

< *Fistularidæ*, Bonaparte, Giorn. Accad. di Scienze, v. 52 (Saggio Distrib. Metod. Animali Vertebr. a Sangue Freddo, p. 35), 1832; Isis, 1833, col. 1200.

< *Scomberidæ* (*Fistularinæ*), Swainson, Nat. Hist. and Class. Fishes, etc., v. 2, pp. 175, 240, 1839.

< *Fistularidæ*, Bonaparte, Nuovi Annali delle Sci. Nat., t. 2, p. 132, 1838; t. 4, p. 190, 1840.

< *Fistularioides*, Bleeker, Enum. Sp. Piscium Archipel. Indico, fam. 133, p. xxvi, 1859.

< *Fistulariüdæ*, Günther, Cat. Fishes Brit. Mus., v. 3, p. 529, 1861.

< *Fistulariüdæ*, Cope, Proc. Am. Assoc. Adv. Sc., v. 20, p. 339, 1872.

= *Fistulariüdæ*, Gill, Arrangement Families Fishes, p. 14, 1872. (Named only.)

< *Fistulariæ*, Fitzinger, Sitzungsber. K. Akad. der Wissensch. (Wien), B. 67, 1. Abth., p. 35, 1873.

< *Fistulariüdæ*, Günther, Int. to Study of Fishes, p. 507, 1880.

= *Fistulariüdæ*, Jordan & Gilbert, Syn. Fishes N. Am., pp. 387, 388, 1882.

*Synonyms as subfamily names.*

- < *Fistularini*, Bonaparte, Giorn. Accad. di Scienze, v. 52 (Saggio Distrib. Metod. Animal Vertebr. a Sangue Freddo, p. 35), 1832; Isis, 1833, col. 1200.  
 < *Fistularini*, Bonaparte, Nuovi Annali delle Sc. Nat., t. 2, p. 132, 1838; t. 4, p. 190, 1840.  
 = *Fistularinæ*, Swainson, Nat. Hist. and Class. Fishes, etc., v. 2, pp. 175, 240, 1839.

Hemibranchs with the first four vertebræ very long; a very elongated and somewhat depressed body; a long tubiform snout; without scales, with the ventrals near the middle, and having five or six rays each, but no spines, and without dorsal spines (the two middle rays of the caudal produced and united into a long filament).

**FISTULARIA.**

- < *Solenostomus*, Klein.  
 < *Fistularia*, Linn., Syst. Nat., 10. ed., v. 1.  
 = *Fistularia*, Lac, Hist. Nat. des Poissons, t. 5, p. 349.  
 = *Channorhynchus*, Cantor, Cat. Malayan Fish., p. 211. (Proposed on account of preoccupation of *Fistularia* by Donati.)

Fistulariids of unique genus.

Type, *F. tabaccaria* Linn.

**MACRORHAMPHOSIDÆ.***Synonyms as family names.*

- < *Aphyostomes*, Duméril, Zool. Anal., 5. fam., p. 106, 1806.  
 = *Centrischini*, Rafinesque, Indice d'Ittiologia Siciliana, p. 34 (33. ord.<sup>1</sup>), 1810.  
 < *Siphostomia* (*Aulostomia*), Rafinesque, Analyse de la Nature, 20. fam., p. —, 1815.  
 < *Bouches en flute*, Cuvier, Règne Animal, t. 2, p. 348, 1817.  
 < *Aulostomides*, Latreille, Fam. Nat. du Règne Animal, p. 129, 1825.  
 < *Centriscoïdes*, Risso, Hist. Nat. de l'Europe Mérid., t. 3, p. 476, 1826.  
 < *Fistularidæ* (*Centriscini*), Bonaparte, Giorn. Accad. di Scienze, v. 52 (Saggio. Distrib. Metod. Animal. Vertebr. a Sangue Freddo, p. 35), 1832; Isis, 1833, col. 1200.  
 < *Fistularidæ*, Bonaparte, Nuovi Annali delle Sc. Nat., t. 2, p. 132, 1838; t. 4, p. 190, 1840.  
 < *Fistularidæ*, Bonaparte, Cat. Metod. dei Pesci Europei, pp. 7, 70, 1846.  
 = *Centriscoïdei*, Bleeker, Enum. Sp. Piscium Archipel. Indico, p. xxiii, 1859.  
 < *Centricidæ*, Günther, Cat. Fishes Brit. Mus., v. 3, p. 518, 1861.

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<sup>1</sup> *Macroramphosus* is included in the 35. ord. *Siluridi* (p. 35.)

- = *Centriscidæ*, Gill, Arrangement Fam. Fishes, p. 25, 1872.  
 < *Centriscæ*, Fitzinger, Sitzungsber. K. Akad. der Wissensch. (Wien), B. 67, 1. Abth., p. 35, 1873.  
 = *Centriscidæ*, Jordan & Gilbert, Syn. Fishes N. A., p. 387, 1882.

*Subfamily synonyms.*

- < *Centriscini*, Bonaparte, Giorn. Accad. di Scienze, v. 52 (Saggio Distrib. Metod. Animali Vertebr. a Sangue Freddo, p. 35), 1832; Isis, 1833, p. 1200.  
 < *Centriscini*, Bonaparte, 1850.  
 = *Centriscinæ*, Gill, Proc. Acad. Nat. Sc. Phila., 1862, p. 234, 1862.  
 < *Orthichthyinæ*, Gill, Proc. Acad. Nat. Sc. Phila., 1862, p. 234, 1862.

Hemibranchs with the four anterior vertebræ much lengthened; bony plates anteriorly and especially about the back; an elongated tubiform mouth; abdominal ventrals with a spine and several rays; a small distinct spinous dorsal about the middle of the body; with the branchiyls and pharangeals mostly present, the fourth superior branchiyl, and first and fourth superior pharyngeals only wanting.

**MACRORHAMPHOSUS.**

- = *Macrorhamphosus*, Lacépède, Hist. Nat. des Poissons, t. 5, p. 136,  
 = *Centriscus*, Cuvier, Règne Animal, 1. ed., t. 2, p. 350, 1817.  
 > *Orthichthys*, Gill, Proc. Acad. Nat. Sci. Phila., 1862, p. 234, 1862.

Macrorhamphosids with an oblong body, graduating into the caudal peduncle, straight back, and about seven dorsal spines.

Type, *M. scolopax* = *Centriscus scolopax* Linn., 1766.

As Messrs. Jordan & Gilbert have recently shown (Proc. U. S. Nat. Mus., v. 5, p. 575, 1883), the *only* species referred by Linnæus at first to the genus *Centriscus*, was the *C. scutatus* (afterwards taken as the type of *Amphisila*), and consequently *Centriscus* cannot be properly used as the designation of the present genus. The name *Macrorhamphosus*, being the first applicable, although imposed by mistake, may be used for it. It is unfortunate that the change should have to be made, and, although fully conversant with the status years ago, I hesitated to propose it. Nevertheless with such excellent authorities as Messrs. Jordan & Gilbert to recognize its necessity, I no longer refuse to accede to the change.

**CENTRISCOPS.**

- = *Centriscops*, Gill, Proc. Acad. Nat. Sci. Phila. 1862, p. 234, 1862.  
*Centriscus* sp., Richardson, *et al.*

Macrorhamphosids with a deep body, abruptly contracted caudal peduncle, an excurrent peaked back, and about four to five dorsal spines.

Type, *C. humerosus* = *Centriscus humerosus* Richardson.

### AMPHISILIDÆ.

#### Family Synonyms.

- = *Amphisiloides*, Bleeker, Enum. Sp. Piscium Archip. Ind., p. xvi, 1859;  
Atlas Ich. des Indes Néerland., t. 5, p. xv, 1865.
- = *Amphisilidæ*, Cope, Proc. Am. Assoc. Adv. Sci., v, 20, p. 338, 1872.
- = *Amphisilidæ*, Gill, Arrangement Families Fishes, p. 25, 1872.

#### Subfamily Synonym.

- = *Amphisilinæ*, Gill, Proc. Acad. Nat. Sci. Phila. (v. 14). p. 234, 1862.

< *Centriscidæ*, pt., Günther, 1861.

< *Centrisci*, pt., Fitzinger, 1873.

Hemibranchs with six or more anterior vertebræ extremely elongated, the caudal much abbreviated, paired selliform dorsal plates connected with the neuropophyses of the dorsal vertebræ, and lateral ones developed in connection with the ribs, an elongated tubiform mouth, abdominal ventrals, two dorsals, and with the entire caudal portion of the body deflected downwards by the encroachment of the dorsal cuirass over the dorsal fins; and with the "fourth supra-branchiyl, and all the superior pharyngeals wanting" (Cope).

### CENTRISCUS.

- = *Centriscus*, Linn., Syst. Nat., 10. ed., v. 1.
- < *Centriscus*, Linn., Syst. Nat., 12. ed., v. 1.
- < *Amphisile* (Klein), Cuvier, Règne Animal, t. 2, p. 350, 1817.
- = *Acentrachme*, Gill, Proc. Acad. Nat. Sci. Phila. (v. 14), p. 234, 1862.
- = *Amphisile*, s. g. *Acentrachme*, Lütken, Vid. Medd. Naturhist. Fören. Kjöbenhavn, 1865, p. 215, 1866.

Amphisilids without a movable spine connected with the posterior process of the dorsal cuirass.

Type, *C. scutatus*.

### AMPHISILE.

- < *Amphisile*, Klein, Hist. Piscium Nat. promov. Miss., p. 28, 1744 (not binomial).
- < *Amphisile*, Cuvier, Règne Animal, t. 2, p. 350, 1817.
- = *Amphisile*, Gill, Proc. Acad. Nat. Sci. Phila. (v. 14), p. 234, 1862.
- = *Amphisile*, s. g. *Amphisile*, Lütken, Vid. Medd. Naturhist. Fören. Kjöbenhavn, 1865, p. 215, 1866.

Amphisilids with a spine at the posterior process of the dorsal cuirass.

Type, *A. strigata* = *Amphisile* sp., Klein.

#### § 4. *Extinct Families.*

In addition to these types, all represented in the existing faunas, there are two fishes no longer living, which cannot be referred to any of the families as now restricted, but appear to be types of peculiar ones. They are the *Urosphen fistularis* and *Rhamphosus aculeatus* of Agassiz; both have been found in the celebrated fish-beds of Mount Bolca. These have been referred to the family Fistulariidae by Dr. Günther, but one of them is more nearly related to the Macrorhamphosidae and Gasterosteidae. They are imperfectly known, but appear to be distinguishable as family types by the following characters, which will doubtless be supplemented by others when well-preserved specimens or characteristic parts shall be critically examined.

#### UROSPHENIDÆ.

Hemibranchs with the first four vertebræ much elongate, a moderately elongated body, a long tubiform mouth (ventrals abdominal? dorsal unknown), and a very large cuneiform caudal.

#### RHAMPHOSIDÆ.

Hemibranchs with the anterior vertebræ normal (not elongated) and separate, about 22 (8 abdominal and 14 caudal) vertebræ in all, plates on the nape and shoulders only, with a tubiform mouth, subthoracic ventrals, a dorsal spine behind the nuchal armature, and the second dorsal and anal far behind and opposite.

#### § 5. *The Pegasidæ.*

Finally, there is a family which has been shifted from place to place in the system, and which has been referred by Prof. Cope to the order Hemibranchii. Its type was regarded as a chondropterygian by Linnæus and the elders, as a syngnathoid fish by Cuvier; first isolated in a family by Latreille; received the family name Pegasidæ from H. Adams in 1854; was pronounced to be related to the Agonidæ by Steenstrup in 1866; placed next to them by Günther (Int., p. 482, 1880), and relegated to the Hemibranchii by Cope. It has also been regarded as the representative of a peculiar order ("ordo 12. Pegasi"), of the "sub-

legio" Lophobranchii by Bleeker, and as a suborder (Hypostomides) of the order Lophobranchii by A. Duméril. Having no skeleton to examine, I retain it in the present order solely on the authority of Prof. Cope, and with some doubt as to its right herein.

### PEGASIDÆ.

#### *Family Synonyms.*

- < *Spherionidi*? Rafinesque, Indice d'Ittiolog. Siciliana, p. 40, 1810.
- < *Pomanchia*, Rafinesque, Analyse de la Nature, 25. fam., 1815.
- = *Hypostomides*, Latreille, Fam. Nat. du Règne Animal, p. 117, 1825.
- < *Syngnathidæ*, Bonaparte, Giorn. Accad. di Scienze, v. 52 (Saggio Distrib. Metod. Animali Vertebr. a Sangue Freddo, p. 39), 1832; Isis, 1833, c. 97, 119.
- < *Syngnathidæ*, Swainson, Nat. Hist. and Class. Fishes, etc., v. 2, pp. 195, 331, 1839.
- < *Syngnathidæ*, Bonaparte, Nuovi Annali delle Sci. Nat., t. 2, p. 130, 1838; t. 4, p. 185, 1840.
- < *Hippocampidæ*, Nardo, Atti Congressi Scienz. Ital. rac. et ord., v. 1, p. 70 (1842), 1845.
- = *Pegasidæ*, Kaup, Archiv für Naturg., 19. Jahrg., B. 1, p. 227, 1853; also Cat. Lophobr. Fishes Brit. Mus., p. 3, 1856.
- = *Pegasidæ*, Adams, Manual Nat. Hist., p. 94, 1854.
- = *Pegasoidæ*, Bleeker, Enum. Sp. Piscium Archipel. Indico, p. xv, 1859.
- = *Pegasidæ*, Günther, Cat. Fishes Brit. Mus., v. 8, p. 146, 1870.
- = *Pegasidæ*, Cope, Proc. Am. Assoc. Adv. Sci., v. 20, p. 339, 1872.
- = *Pegasi*, Fitzinger, Sitzungsber. K. Akad. der Wissensch. (Wien), B. 67, 1. Abth., p. 49, 1873.
- = *Pegasidæ*, Cope, Proc. Am. Phil. Soc., v. 13, p. 25, 1873.

#### *Subfamily Synonyms.*

- = *Pegasini*, Bonaparte, Giorn. Accad. di Scienze, v. 52 (Saggio Distrib. Metod. Animali Vertebr. a Sangue Freddo, p. 39), 1832.
- = *Pegasini*, Bonaparte, Nuovi Annali delle Sci. Nat., t. 2, x, p. 130, 1838; t. 4, p. 186, 1840.
- = *Pegasini*, Nardo, Atti Congressi Scienz. Ital. rac. et ord., v. 1, p. 70 (1842), 1844.
- = *Pegasini*, Bonaparte, Catal. Metod. Pesci Europei, pp. 9, 89, 1846.\*

Hemibranchs? with the snout projecting and the mouth inferior.